Total Maximum Daily Loads for Sediment
And Monitoring and Implementation Recommendations
San Diego Creek and Newport Bay, California

U.S. Environmental Protection Agency
Region 9

Approved:

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Section 1. Introduction

What Is A TMDL?

Section 303(d)(1)(A) of the Clean Water Act (CWA) requires that "Each State shall identify those waters within its boundaries for which the effluent limitations...are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and establish Total Maximum Daily Loads (TMDLs) for such waters. As part of California's 1996 303(d) list submittal, the Santa Ana Regional Water Quality Control Board (RWQCB) identified Newport Bay and San Diego Creek as water quality limited due to clean sediment loading (in addition to other pollutants not addressed in this TMDL) and designated this watershed as a high priority for TMDL development. The RWQCB began work on the sediment TMDL in 1996.

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in EPA guidance documents (e.g., EPA, 1991). A TMDL is defined as "the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the waterbody to assimilate pollutant loadings (the Loading Capacity) is not exceeded. A TMDL is also required to be developed with seasonal variations and include a margin of safety to address uncertainty in the analysis. In addition, pursuant to the regulations at 40 CFR 130.6, states must develop water quality management plans which incorporate approved TMDLs and implementation measures necessary to implement the TMDLs.

Upon establishment of TMDLs by EPA or the State, the State is required to incorporate the TMDLs along with appropriate implementation measures into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7). The Regional Board Basin Plan, and applicable state-wide plans, serve as the State Water Quality Management Plan governing the Newport Bay watershed. If the State subsequently adopts and submits for EPA approval TMDLs which are different from the TMDLs established by EPA, EPA will review the State-submitted TMDLs to determine if they meet all TMDL requirements. If EPA approves the State TMDLs, EPA expects the State-established TMDLs would be applicable for the Newport Bay watershed.

Why Is EPA Establishing These TMDLs?

The Environmental Protection Agency (EPA) has oversight authority for the 303(d) program and is required to review and either approve or disapprove the TMDLs submitted by states. If the EPA disapproves a TMDL submitted by a state, the EPA is required to establish a TMDL for that waterbody.

On October 31, 1997, EPA entered into a consent decree (decree), Defend the Bay, Inc. v. Marcus, (N.D. Cal. No. C 97-3997 MMC), which established a schedule for development of TMDLs in San Diego Creek and Newport Bay. The decree required development of nutrient and sediment TMDLs by January 15, 1998. The agreement also provided that EPA would establish the required TMDLs within ninety (90) days, if the State failed to establish an approved TMDL by the deadline.

The RWQCB adopted TMDLs for clean sediment for Newport Bay and San Diego Creek on October 17, 1997. Before the TMDLs can be submitted to EPA for approval, the State Water Resources Control Board (SWRCB) must approve the TMDLs and the State Office of Administrative Law (OAL) must concur. Because the SWRCB and OAL have not completed their reviews of the sediment TMDLs and submitted the TMDLs for EPA action, EPA is now establishing the TMDLs for sediment in order to meet the requirements of the decree.

TMDL Organization and Comparison With State TMDLs

This TMDL report is organized in the following sections which provide the analytical basis for the TMDLs:

- Problem Statement
- Numeric Targets
- Source Analysis
- Estimates of Loading Capacity, TMDLs, and Allocations
- Margin of Safety
- Seasonal Variations
- Critical Conditions
- Public Participation

In addition, the report endorses the implementation and follow-up monitoring actions adopted in the RWQCB Basin Plan amendment, which includes the TMDLs and associated actions.

The TMDLs proposed in this document are virtually identical to TMDLs adopted by the RWQCB in October 1997. The EPA TMDL report differs from the RWQCB TMDL report as follows:

- Organization of the EPA report follows the format used in EPA Region 9-established TMDLs. The RWQCB format is designed to provide substantially more background information and to meet the needs of the Basin Planning administrative procedures.

- The EPA TMDL report provides less detailed background and explanatory information, referring the reader instead to the RWQCB staff reports for more in-depth discussions. Adequate detail is provided in the EPA report to describe the basis for TMDL content.

- The EPA TMDL report provides slightly different rationales for the numeric targets (although the numeric targets themselves are virtually identical to the RWQCB targets). In particular, the basis for the load reduction target is discussed in more detail.

- The EPA TMDLs include load allocations which are different from the allocations adopted by the RWQCB due to adjustments in the estimated total sediment loadings (and associated changes in the TMDLs and allocations) made to reflect land use changes between 1983 and 1993. This adjustment results in increases in loads allocated to urban areas and construction and decreases to loads allocated to open space and agricultural areas based on land use changes. In addition, the EPA TMDLs reflect arithmetic corrections needed to ensure that the sum of the allocations equals the total allowed loads. The RWQCB TMDL report's total allowed annual average sediment loading target exceeds the sum of the load allocations by 10,000 pounds per year. The State is in the process of correcting this minor administrative oversight, and the EPA TMDL load allocations reflect the adjustments the State intends to make to address both the arithmetic corrections and more recent land use information (personal communications, Ken Theisen, RWQCB, February 9 and 26, 1998).

Section 2. TMDL Summary

These TMDLs are being established at levels sufficient to result in attainment of applicable water quality standards for clean sediment, including designated beneficial uses and narrative water quality objectives. The TMDLs are based on and are virtually identical in most respects to the sediment TMDLs adopted by the RWQCB in October 1997.

Exceedences of narrative water quality standards (called objectives in California) for sediment for the San Diego Creek/Newport Bay watershed prompted the listing of these waters on the 303(d) list and the establishment of these TMDLs. A watershed map is found on page 6. Table 1 presents numeric targets which represent interpretations of the applicable narrative objectives and provide measurable goals for assessing the effectiveness of the TMDLs and their associated allocations in bringing about attainment of water quality standards in this watershed:

Table 1: Sediment TMDL Numeric Targets

Indicator and Rationale	Numeric Target(s)	Source
Maintenance of acreage distribution of Upper Newport Bay in four key habitat types (Physical measure of desired habitat mix in key habitat area which is sensitive to effects of sediment loading from upstream)	No more than 1% change in acreage in any of the following habitat acreages: - marine wildlife habitat (210 ac) - mudflat habitat (214 ac) - salt marsh habitat (277 ac) - riparian habitat (31 ac)	- California Department of Fish and Game, 1989, "Upper Newport Bay Ecological Reserve Management Plan" - RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2,1997
Maintenance of marine habitat depth in Upper Newport Bay (Physical measure of desired habitat characteristic for key habitat type which is sensitive to effects of sediment loading)	Minimum depth of marine habitat in Sediment Basins 1 and 2 in Upper Newport Bay is 7 feet below Mean Sea Level	RWQCB Staff Report, July 2, 1997 RWQCB Staff Report, April, 1998
Total annual average watershed sediment load (tons per year as 10 year running average) (Direct physical measure of sediment loading which watershed can apparently assimilate and support its beneficial uses)	No more than 125,000 tons per year	- RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2, 1997
Frequency of dredging of Upper Newport Bay In-Bay sediment basins 1 and 2 (years) (Measure of key sediment management factor which is critical to maintenance of Upper Newport Bay habitat quality)	Dredging occurs no more often than once every 10 years, with the long term goal of reducing dredging frequency to no more than once every 20-30 years,	- RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2, 1997

Available capacity of in-channel and foothill sediment control basins (% of total capacity) (Measure of amount of total sediment trapping capacity available each year prior to onset of wet weather season and associated sediment discharges)	At least 50% of capacity of each in-channel and foothill sediment control basin is available each year prior to November 15th.	RWQCB Basin Plan Amendment, October 17, 1997.

Total sediment loading and deposition to the watershed were estimated based on analysis conducted by the RWQCB (RWQCB Staff Report, July, 1997). The RWQCB evaluated sediment sources and transport by reviewing result of two sediment budgets (Boyle Engineering, 1983 and Trimble, 1995), monitoring data (reported in RWQCB, July 1997) and bathymetry surveys of the creek channels and Upper Newport Bay (reported in RWQCB, July, 1997). Estimates of average annual total sediment discharges into the watershed were in the general range of 250,000-275,000 tons per year. Approximately half of the sediment is deposited in Newport Bay and half in the drainages of San Diego Creek and its tributaries. About 94% of the sediment deposited in Newport Bay comes from San Diego Creek. For these TMDLs it was infeasible to estimate source contributions at a fine scale; therefore, sources were analyzed by general land use category. Contributions from individual source categories (i.e., open space, agriculture, construction sites, and urban areas) were estimated from analysis done in the Boyle Engineering sediment budget (Boyle Engineering, 1983), as adjusted to reflect changes in land use between 1983 and 1993.

The loading capacity of the watershed for sediment discharges and the associated TMDLs were estimated based on analysis of historical sediment loading impacts on the key habitat area of the watershed-- Upper Newport Bay-- and in the main channels of San Diego Creek. The Upper Bay supports a key Ecological Reserve containing several key habitat types which have the potential to be changed or degraded by excessive sediment deposition. The optimal mix of shallow and deeper water habitats along with the appropriate balance of saline and freshwater areas is maintained through periodic dredging of the sediment basins in the Upper Bay. Periodic dredging of many channels of San Diego Creek is also needed to maintain flood control capacity. Because sediment basin and channel dredging is very expensive and produces adverse environmental impacts, one goal of the TMDLs is to reduce the frequency of needed dredging of the Bay sediment basins and Creek channels by reducing the rate at which the basins and channels are filled with sediments from the San Diego Creek watershed.

The existing sediment control plan (208 Plan) for the watershed establishes a long term 50% sediment loading reduction goal (RWQCB, July 1997). This 50% load reduction is expected to result in protection of the Upper Bay habitat areas by ensuring that an appropriate mix of shallow and deeper water habitats along with the appropriate balance of saline and freshwater conditions are maintained. By reducing the frequency of needed dredging of the

INSERT MAP HERE

Upper Bay sediment basins and creek channels to about once every ten years at the outset and once every 20-30 years in the future, it should prove feasible to continue dredging as part of the sediment control plan. In addition, the 50% reduction is expected to result in protection of habitat areas within San Diego Creek channels by eliminating the adverse effects of excessive sediment loading on Creek habitat and rendering needed dredging cost-effective. Because habitat degradation is the cause of water quality standards violations which prompted the development of the TMDLs, protection of habitat quality through the sediment reductions planned through these TMDLs should result in attainment of standards. Therefore, the TMDLs are based on a 50% reduction target for annual sediment loading to both San Diego Creek watershed and to the Newport Bay watershed as a whole.

Because the expected effectiveness of this reduction target is based on professional judgement and is subject to some uncertainty, the TMDLs developed by the RWQCB were adopted as first phase TMDLs, to be followed by regular monitoring and review over the next ten years. EPA endorses this phased approach to reviewing the effectiveness of these TMDLs and making changes if needed.

Table 2 summarizes the TMDLs and associated load allocations for the significant sediment sources of concern in the watershed. The TMDLs and allocations are intended to be implemented as 10-year running annual averages because sediment loadings vary substantially over long time periods and different watershed areas. In addition, because the effects of sediment loadings on beneficial uses are felt over long periods of time, establishing TMDLs based on long time steps better account for source analysis uncertainties and variations in critical conditions than TMDLs based on daily time steps. Separate TMDLs are being established for San Diego Creek and Newport Bay in order to:

- ensure that beneficial uses in both waterbodies are protected,
- assist the agencies charged with controlling sediment sources and removing sediment from channels and sediment basins in implementing effective actions to address sediment problems,
- account for temporary sediment storage in San Diego Creek channels, and
- take into account the loads from other areas of the Newport Bay watershed which are not part of San Diego Creek watershed (about 6% of total sediment loading to the Bay).

These TMDLs do not include separate load allocations for natural background sources because virtually the entire watershed and its drainages have been subject to some level of human impact which has the probable effect of increasing sediment loading rates above naturally occurring erosion rates.

Table 2: TMDLs and Load Allocations for San Diego Creek and Newport Bay
(Tons per year expressed as 10 year rolling averages)

Element	Area Covered	Quantity (Tons per year)
TMDL for San Diego Creek	**Discharges to San Diego Creek**	**62,500**
San Diego Creek Load Allocations	Open Space Areas and Channels Agricultural Land Areas and Channels	28,000 19,000
San Diego Creek Wasteload Allocations	Construction Sites Urban Areas and Channels	13,000 2,500
TMDL for Newport Bay	**Discharges to Newport Bay**	**62,500**
Newport Bay Load Allocations	Open Space Areas and Channels Agricultural Land Areas and Channels	28,000 19,000
Newport Bay Wasteload Allocations	Construction Sites Urban Areas and Channels	13,000 2,500

The TMDLs account for seasonal variation by recognizing that (1) sediment loading varies substantially by season and between years, and (2) sediment impacts are felt over multi-year time periods. Sediment loading and transport are predictable only over long timeframes. Moreover, in contrast to pollutants which cause short-term beneficial use impacts and are thus sensitive to seasonal variation and critical conditions, the sediment impacts in this watershed occur over much longer time scales. For these reasons, the longer time frames used in these TMDLs are appropriate.

The TMDLs provide an adequate margin of safety to account for uncertainty by:

- basing the TMDLs and allocations on a total sediment loading estimate which falls at the low end of the range of estimates, resulting in lower allowed loads from each source;

- incorporating sensitive numeric targets focusing upon maintenance of optimal habitat conditions, exceedence of which would trigger review and probable revision of the TMDL, allocations, and/or sediment source management approaches;

- incorporating numeric targets, TMDLs, and allocations for both San Diego Creek and Newport Bay in order to focus attention on reduction of sediment impacts in the Creek channels and the Bay,

- recognizing the importance of periodic channel and basin dredging to maintain beneficial uses, and noting the ability to dredge more frequently if the 50% reduction target proves insufficient to maintain habitat quality,

- assuming that all sediment sources are subject to anthropogenic influence and are therefore controllable (instead of assuming a portion of the loads are “natural” and therefore uncontrollable), and

- endorsing the State’s rigorous monitoring, reporting, and annual review plan.

The RWQCB adopted an implementation, monitoring, and review plan for the Newport Bay/San Diego Creek sediment TMDLs (RWQCB, October 17, 1997). EPA endorses this plan and expects that appropriate measures to control sediment sources consistent with the TMDLs will be implemented in the watershed as soon as is practicable. The RWQCB also established a 10 year timeframe for attainment of the TMDL and associated targets. EPA endorses this implementation and attainment timeframe because it implies an aggressive approach to addressing sediment sources, while recognizing likely time lags between the implementation of controls and the recovery of the receiving waters from sediment impacts. It should be noted, however, that NPDES permits affected by the wasteload allocations established in this TMDL must be established consistent with NPDES permitting requirements, including requirements concerning compliance schedules. EPA will review the implementation plan when the State completes its administrative approval process and accepts it as part of its water quality management plan.

Section 3. TMDL Analysis

Section 3.1 Problem Statement

An assessment of the water quality problems is necessary to clearly identify the water quality standards being violated or threatened and to identify the pollutant(s) for which the TMDLs are being developed. The description below is taken largely from the RWQCB Staff Reports issued in July 1997, September 1997, and October 1997.

Section 3.1.1. The Newport Bay Watershed

The Newport Bay watershed is located in central Orange County, California (Figure 1). The watershed encompasses 154 square miles and includes portions of the Cities of Newport Beach, Irvine, Laguna Hills, Lake Forest, Tustin, Orange, Santa Ana, and Costa Mesa. The watershed is encircled by mountains on three sides: the Santa Ana Mountains to the north, the Santiago Hills to the northeast, and the San Joaquin Hills to the south. The runoff from these mountains drains across the Tustin Plain and enters Newport Bay via Peters Canyon Wash and San Diego Creek. The San Diego Creek watershed, which encompasses Peters Canyon Wash, is 105 square miles in area. The other 49 square miles of drainage that enter Newport Bay include the Santa Ana-Delhi Channel, Bonita Creek, Big Canyon Wash, and a number of smaller tributaries which drain to the Lower Newport Bay. Newport Bay is a long, enclosed estuary roughly divided into the Upper and Lower Bay areas. The entire Bay up to the mouth of San Diego Creek is subject to tidal influence.

The watershed has gradually been developed from the rural agricultural system of the early 1900's to the largely urban development of today. In 1983, agriculture accounted for 22% and urban uses for 48% of the area of the Newport Bay watershed. In 1993, agricultural uses accounted for 12% and urban uses over 64% of the area (RWQCB Nutrient TMDL Staff Report, August 29, 1997)**.** Agricultural activities in the watershed include row crops (primarily strawberries), avocados, lemons, and commercial nurseries. Urban development in the area consists of residential, commercial, and light industrial land uses.

The major geologic units of the San Diego Creek watershed consist of alluvium, terrace deposits, and bedrock. The bedrock consists primarily of sedimentary formations of post-Oligocene age: sandstone, siltstone, shale, and conglomerate with scattered minor amounts of intrusive volcanic rock. Most of these rocks are well consolidated, with the younger units being poorly cemented. The older bedrock units are well cemented and form resistant steep slopes. Alluvium and terrace deposits are the youngest (Quaternary) sedimentary deposits within the watershed and are the most easily eroded. Recent alluvium consists of sand and gravel deposits, containing variable amounts of both cobbles and boulders, on the modern floodplain. The older terrace deposits are composed mostly of sands and dense clays deposited on an ancient, relatively uniform, gently sloping plain. As sediment yields vary with runoff and land use, the soils are the primary source of eroded sediments.

The watershed has a Mediterranean type climate characterized by short, mild wet winters and hot dry summers. There are two types of rainstorms in this region: most are related to the extra tropical cyclones of winter, and the others are infrequent summer thunderstorms. Both types of storms produce intense rainfall. According to the Orange County Environmental Agency, the 40-year average annual rainfall recorded at Tustin-Irvine Ranch Station was calculated to be 12.67 inches of which 90% occurs between November and April.

3.1.2 Beneficial Uses and Water Quality Objectives

Table 3 below summarizes the beneficial uses of the surface water bodies within the Newport Bay Watershed, as identified in the Basin Plan. The listed beneficial uses are Groundwater Recharge, Navigation, Body Contact Recreation, non-Body Contact Recreation, Commercial and Sport Fishing, Warm Water Aquatic Habitat, Biological Habitats of Special Significance, Wildlife Habitat, Rare and Endangered Species Habitat, Spawning reproduction and development, Marine Habitat, Shellfish Harvesting, and Estuarine Habitat. The "|" symbol represents an intermittent beneficial use, and access to San Diego Creek Reach 1 (downstream of Jeffrey Road) is restricted by Orange County Public Facilities and Resources (OCPFR) so body contact recreation is limited.

Table 3: Beneficial Uses of Surface Water Bodies in the Newport Bay Watershed

Water Body	GWR	Nav	Rec1	Rec2	Comm	Warm	Biol	Wild	Rare	Spwn	Mar	Shell	Est
San Diego Crk. Reach 1 (Jeffrey Road to Newport Bay)			X	X		X		X					
San Diego Crk. Reach 2 (Jeffrey Road to Headwaters)	|		|	|		|		|					
Bonita Creek	|		|	|		|		|					
Serrano Creek	|		|	|		|		|					
Peters Cyn. Wash	|		|	|		|		|					
Hicks Cyn. Wash	|		|	|		|		|					
Bee Cyn. Wash	|		|	|		|		|					
Borrego Cyn. Wash	|		|	|		|		|					
Agua Chinon Wash	|		|	|		|		|					
Laguna Cyn. Wash	|		|	|		|		|					
Rattlesnake Cyn. Wash	|		|	|		|		|					
Sand Cyn. Wash	|		|	|		|		|					
Other Tributaries	|		|	|		|		|					
Upper Newport Bay			X	X	X		X	X	X	X	X	X	X
Lower Newport Bay		X	X	X	X			X	X	X	X	X	

For Newport Bay, the Basin Plan specifies a narrative objective to ensure that, "Enclosed bays and estuaries shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors." For Newport Bay tributaries, the Basin Plan specifies a narrative objective for settleable and suspended solids that “Inland surface waters shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as the result of controllable water quality factors.” To comply with these objectives, the discharge, transport, and deposition of sediment within the drainage channels throughout the watershed and the bay must not result in a loss of any of the various types of marine and fresh water aquatic and wetland habitats, prevent water recreation, or impede navigation. Additionally, projects designed to control sediment within the watershed, such as dredging, channel modification and stabilization projects, and maintenance of flood and sediment control capacity must also not result in a net loss of the beneficial uses provided by the various aquatic and wetland habitats.

Impaired beneficial uses in Newport Bay presently include: 1) wildlife habitat; 2) estuarine habitat; 3) rare, threatened, or endangered species habitat; 4) marine habitat; 5) preservation of biological habitat of special significance (Upper Newport Bay Ecological Reserve); 6) spawning, reproduction and development, 7) commercial and sport fishing; and, 8) navigation. The accumulation of sediment in the Upper Bay has dramatically altered its topography and the potential for tidal exchange, in turn leading to significant changes in the type and availability of aquatic and wildlife habitat. These changes are not in concert with the management objectives identified by the Department of Fish and Game for the Upper Newport Bay Ecological Reserve, which occupies a significant part of the Upper Bay. Sedimentation also has immediate adverse effects on wildlife: for example, sediment deposition smothers the bottom-dwelling (benthic) community, reducing the food supplies available for other organisms. The accumulation of sediment is also causing significant navigational problems which impair the use of the Bay by boaters and swimmers. Dredging in the Upper Bay also alters the topography and the tidal exchange, but in a way that provides more salt water for support of the salt marsh beneficial uses while temporarily removing a portion of the benthic community.

Impacts to wildlife habitat also occur within portions of San Diego Creek, and the other tributary drainages within the entire Newport Bay Watershed, as the sediment is transported from the various sources throughout the watershed down through the bay. The Basin Plan’s narrative objective for settleable and suspended solids for these inland surface waters is that they shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as the result of controllable water quality factors. Channel modification projects and sediment retention basins have been, and are proposed to be, implemented to reduce sediment erosion, remove accumulated sediment to prevent the sediment from washing into the Upper Bay, and provide flood control and protection. While these projects can reduce adverse impacts to beneficial uses of Newport Bay, they do affect beneficial uses in the tributaries. Approximately 170 acres of seasonal, perennial, and intermittent warm water aquatic habitat and riparian wetland habitat that exist sporadically within the numerous drainage channels in the watershed may be disturbed or destroyed by channel modification projects.

If the sediment load during a very wet year exceeds the amount of available sediment trapping capacity in the watershed then sediment is transported through the Upper Bay and into the Lower Bay. The Basin Plan identifies these waters as water quality limited. That is, the sediment is being discharged in an amount that does not ensure compliance with the applicable water quality standards (beneficial uses and water quality objectives). The standards are not expected to be attained with the implementation of technology-based controls.

There will be significant impacts to beneficial uses if sediment is not controlled within the Newport Bay/San Diego Creek Watershed. The Corps of Engineers has estimated (February 1993) that if the Upper Newport Bay is not dredged to maintain a deep marine aquatic habitat, then the aquatic habitat area of the bay will fill in and become mud flats, the mud flats will fill in to become salt marsh, and the salt marsh may ultimately fill in to become upland meadow. (U.S. Army Corps of Engineers, 1993, cited in RWQCB Staff Report, September 1997). This would be in direct conflict with the established beneficial uses and the Department of Fish and Game's plan for the long term management of the Upper Bay as a salt mash habitat, and habitat for several endangered species. The Department of Fish and Game's management plan for the Upper Newport Bay Ecological Reserve was used to restore and enhance the area of the in-bay sediment basin Unit 1. It was the intent of this management plan, and Fish and Game's commitment to implement a portion of the sediment control plan, that resulted in the creation and use of the in-bay sediment basin Unit 1, together with up to 50-60 acres of marine aquatic habitat to a depth of 7 feet below mean sea level (MSL) and the creation of two nesting islands. Historically, this area had been a shallow marsh area and salt evaporation ponds. The intent of the 208 Plan was the combined use of the area as a sediment trap and deep marine aquatic habitat to provide an area of higher salinity and deeper water for halibut spawning.

Section 3.1.3. History of Sediment Problems

Significant modifications have been made to the Newport Bay/San Diego Creek Watershed over the past 150 years, including major modifications to the drainage systems. These changes have resulted in a significant increase in the amount of sediment deposited in the Bay. It is generally thought that the Santa Ana River created Newport Bay. It is likely that the Santa Ana River meandered around what is now Costa Mesa and either entered Newport Bay in the upper bay or into the northwest end of the lower bay by Lido Island, depending on which side of the mesa the river was flowing. In the mid-19th Century the Santa Ana River flowed through lower Newport Bay. In addition, the San Diego Creek watershed may not have even been discharging into Newport Bay in the mid-19th Century. San Diego Creek and the small tributaries from the Santiago Hills drained into an ephemeral lake and the Swamp of the Frogs and then into the Santa Ana River. The Santa Ana-Delhi, Sand Canyon, and Bonita Creek drainages probably did drain to the upper bay. In the early 20th century, a major flood event on the Santa Ana River caused a significant amount of sediment to be deposited into the lower bay, and the local community dug a channel for the river to bypass the bay and discharge directly to the ocean. In 1920 the Santa Ana River was permanently diverted into the current flood control channel that discharges directly to the ocean. Although removing the Santa Ana River from discharging into the bay eliminated a significant source of sediment into the bay, this diversion also removed the scouring effects of the River in removing accumulated sediment. This forever altered the sediment deposition in and transport through the bay.

In the late 19th and early 20th centuries, the watershed was also undergoing a change in land use from ranching and grazing to farming. The ephemeral lake and the Swamp of the Frogs were drained, and the vegetation in the marsh cleared, to make room for farming. Drainage channels were constructed to accommodate the farming activity; and these drainages did not always follow the natural drainage patterns. All of these channels constructed in the San Diego Creek Watershed were drained to San Diego Creek and Newport Bay. Following World War II another land use change began in the watershed, from farming to residential and commercial developments. These included projects to expand the capacity of the drainages to provide flood protection to the structures being built. These changes to the drainage patterns in the San Diego Creek Watershed culminated in the channelization of San Diego Creek in the early 1960s by Orange County Flood Control. This channelization of San Diego Creek provided the necessary flood control protection. It also isolated the San Joaquin Marsh, the last remaining portions of the historic marsh upstream of Upper Newport Bay, from San Diego Creek.

The U.S. Army Corps of Engineers has estimated that historic sediment deposition in upper Newport Bay (prior to 1900) may have been as low as 1 inch in 35-40 years. This would be approximately 500 to 1000 tons/year if the deposition of sediment occurred in the 100 to 200 acres of water area in the Upper Bay. This deposition rate was increased significantly in the early 1900's when numerous drainage modifications were made in the watershed, and the Santa Ana River was channelized to its current configuration to keep it from discharging into the bay. The drainage projects drained a historic swamp in the area of John Wayne Airport that used to intercept sediment from the San Diego Creek watershed. The San Diego Creek drainage was also diverted into Newport Bay. These changes profoundly affected the rate of sediment deposition in the Bay. Based on data provided by the County of Orange, approximately 7 feet of sediment has been deposited in Upper Newport Bay in the last 12 years, which is approximately 7 inches per year at a rate of 125,000 to 250,000 tons per year over 100 to 200 acres.

The erosion/siltation problem in the Newport Bay Watershed was carefully studied in the early 1980's and a sediment control plan (the 208 Plan) was developed. The County of Orange, the Cities of Irvine, Tustin, and Newport Beach, the Irvine Company, and the State Department of Fish and Game formed a local Sediment Committee to implement the 208 Plan. The goal of the 208 plan is to reduce sediment discharges to Newport Bay by 50% through the implementation of the following: 1) Best Management Practices (BMPs) for controlling sediment erosion from construction sites and the agricultural land in the watershed; 2) the construction of numerous sediment retention basins throughout the watershed; and 3) the construction and use of two areas within Upper Newport Bay as sediment traps. The sediment control plan proposed in the 208 Report includes: the construction of numerous sediment trapping basins in the foothills of the watershed; the construction of sediment retention basins in lower San Diego Creek; the implementation of Best Management Practices (BMPs) for construction and other activities in the upper watershed within the jurisdictions of the County of Orange, the Cities of Tustin and Irvine; and, the implementation of agricultural BMPs by the Irvine Company on the agricultural land in the watershed. The final element of the sediment control plan is the use of Upper Newport Bay as a sediment trap for fine grained sediment that will not readily settle in the constricted flood control channels, or the in-channel sediment traps, within the watershed. The sediment control plan was also combined with the County's Flood Control Master Plan so that flood control channel capacity and bank stabilization could be addressed concurrently. The 208 Plan serves as the basis for the sediment TMDLs.

Section 3.2. Numeric Targets

Section 303(d)(1)(C) states that TMDLs "shall be established at a level necessary to implement the applicable water quality standards...." Numeric targets help to interpret the narrative water quality standards for San Diego Creek/Newport Bay and establish the linkage between attainment of the standards and the TMDLs. Because no numeric objectives exist to guide the development of sediment TMDLs for this watershed, these TMDLs include numeric targets based on a set of surrogate indicators which together represent goals for sediment reductions in the watershed which should result in beneficial use attainment. The targets are based on analysis conducted by the RWQCB staff (July, 1997, September, 1997, and October, 1997). The targets are listed in table 4; the basis for targets is discussed in the following section.

Table 4: Sediment TMDL Numeric Targets

Indicator and Rationale	Numeric Target(s)	Source
Habitat Composition: Maintenance of acreage distribution of Upper Newport Bay in four key habitat types (Physical measure of desired habitat mix in key habitat area which is sensitive to effects of sediment loading from upstream)	No more than 1% change in acreage in the following habitat acreages: - marine wildlife habitat (210 ac) - mudflat habitat (214 ac) - salt marsh habitat (277 ac) - riparian habitat (31 ac)	- RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2, 1997
Maintenance of marine habitat depth in Upper Newport Bay (Physical measure of desired habitat characteristic for key habitat type which is sensitive to effects of sediment loading)	Minimum depth of marine habitat in Sediment Basins 1 and 2 in Upper Newport Bay is 7 feet below Mean Sea Level	RWQCB Staff Report, July 2, 1997 RWQCB Staff Report, April, 1998
Total annual average watershed sediment load (tons per year as 10 year running average) (Direct physical measure of sediment loading which watershed can apparently assimilate and support its beneficial uses)	No more than 125,000 tons per year	- RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2, 1997

Frequency of dredging of Upper Newport Bay In-Bay sediment basins 1 and 2 (years) (Measure of key sediment management factor which is critical to maintenance of Upper Newport Bay habitat quality)	Dredging needed no more often than once every 20-30 years	- RWQCB Basin Plan Amendment and Staff Report, October 17, 1997 - RWQCB Staff Report, July 2, 1997
Available capacity of in-channel and foothill sediment control basins (% of total capacity) (Measure of amount of total sediment trapping capacity available each year prior to onset of wet weather season and associated sediment discharges)	At least 50% of capacity of each in-channel and foothill sediment control basin is available each year prior to November 15th.	RWQCB Basin Plan Amendment, October 17, 1997.

Habitat Composition Target for Upper Newport Bay

Excessive sediment discharges to Upper Newport Bay have the potential to cause adverse habitat modification and harmful reductions in tidal flushing and the associated distribution of salt water and freshwater habitat areas. Therefore, maintenance of a desirable mix of habitat types in the Ecological Reserve area is a particularly critical goal for the TMDLs. These TMDLs establish numeric targets both for the acreage distribution of habitat types in this area and for allowable percent changes in habitat types. These targets are based on RWQCB staff analysis of the Upper Newport Bay Ecological Reserve Management Plan and input from public commenters. Upper Newport Bay Ecological Reserve provides habitat for a wide variety of fish, birds, and mammals, including a number of threatened and endangered species, and a balanced habitat mix needs to be maintained to protect this designated beneficial use. Because the resident species are very sensitive to changes in habitat composition which could occur due to excessive sediment loading, it is appropriate to include a sensitive numeric target which would trigger a prompt and aggressive response should habitat composition begin to change.

Maintenance of Minimum Marine Habitat Depth in Upper Newport Bay

Related to the target above, marine habitat areas associated with Sediment Basins 1 and 2 in the Upper Newport Bay Ecological Reserve need to be maintained at a minimum depth of about 7 feet below Mean Sea Level in order to fully support the beneficial uses associated with the Reserve. Basin depth is highly sensitive to sediment loading rates into Upper Newport Bay from San Diego Creek. Current plans for maintenance of the Unit 1 and Unit 2 Sediment Basins in Upper Newport Bay Ecological Reserve call for dredging periodically to a depth of 14 feet below Mean Sea Level, and utilization of 7 feet of that depth for sediment trapping purposes. By reducing sediment loadings by about 50%, consistent with the proposed TMDLs, it should be possible to maintain the target minimum depth of Sediment Basins 1 and 2 through relatively infrequent dredging (see the dredging target below). This numeric target addressing water depth is an appropriate surrogate indicator of whether a key habitat area is maintained and whether the proposed sediment control strategies are working.

Total Sediment Loading To Watershed

A target for total annual average sediment loading to the watershed is established to provide an overall mass loading goal for the TMDLs. Total mass loading of sediment in excess of the watershed's assimilative capacity is the main cause of habitat degradation in the Upper Bay and other channel habitat areas, and of channel aggradation which necessitates more frequent dredging for flood control purposes. The target for this indicator is based on a 50% load reduction judged by RWQCB staff to be adequate to restore beneficial uses of concern. This target load reduction is a reasonable initial estimate of needed reductions because it would result in an average rate of average sediment deposition in Upper Newport Bay low enough to require sediment basin dredging no more often than about once every ten years at the outset, and approximately once every 20-30 years in the future. Because maintenance of beneficial uses in Newport Bay depends on this periodic dredging, it is necessary to establish sediment reduction targets adequate to allow less frequent dredging. RWQCB staff analysis indicates that with a 50% average reduction in sediment loading, dredging of the sediment basins (and Creek channels) would be affordable by the responsible agencies, thereby increasing the likelihood that the overall sediment management plan can be fully implemented.

The 50% reduction target which drives the TMDLs and associated allocations is somewhat difficult to link precisely and directly to the beneficial use issues of concern in the watershed which are associated with excessive sediment loading. No analysis of the direct effect of sedimentation on beneficial uses has been performed to date, and data needed to perform such an analysis are not readily available. Given the paucity of available information about the degree of sediment effects, the rationale supporting this target which is discussed in the preceding paragraph is reasonable. The RWQCB TMDLs are based on an iterative "phased" approach which provides for initial estimation of needed sediment reductions based on currently available information, and follow-up monitoring, implementation, and evaluation to assess the effectiveness of the TMDLs and associated implementation plan (EPA, 1991). Because the local commitment to monitor and implement the sediment control plan is high, it is very likely that the adaptive management aspects of the phased approach will be carried out. It should be noted that the 50% reduction target is quite aggressive and depends upon the implementation of several kinds of sediment control practices and activities. Therefore, given the lack of data to inform more precise TMDLs estimates and the level of commitment to follow-up monitoring, implementation, and TMDL evaluation, it is appropriate to set the basic reduction target based on the analysis summarized above. For more information concerning the linkages between the sediment control plan, monitoring plans, and analysis supporting the numeric targets, TMDLs, and allocations, see RWQCB Staff Reports dated July 1997 and October 1997.

Dredging Frequency

Unlike most watersheds, where it is infeasible to mitigate the impacts of sediment after it reaches the waterbodies of concern, dredging of key channel and sediment basins is a key element of the Newport Bay/San Diego Creek sediment management plan. However, dredging costs are extremely high. In order to ensure that the sediment management plan is reasonably assured of attaining the goal of protecting habitat uses, it is necessary to reduce the frequency of needed dredging in the Upper Newport Bay sediment basins. The RWQCB analysis indicates that by reducing the frequency of needed dredging to no more than once every ten years at the outset, and about once every 20-30 years in the future, the responsible agency should be reasonably able to carry out the dredging on a timely basis. As a result, the overall sediment control plan is reasonably assured of success. Therefore, these TMDLs incorporate a dredging frequency target as a management monitoring indicator. If it turns out that dredging is needed more than once every 20-30 years, this result would suggest the need to revise the sediment budget and/or tighten sediment source controls in the watershed as a more cost effective means of addressing sediment mass loading impacts.

Available Capacity of In-Channel and Foothill Sediment Control Basins

As discussed in the Problem Statement, a key aspect of the sediment control strategy being implemented in the Newport Bay watershed is the use of in-channel and foothill sediment retention basins at several locations in San Diego Creek watershed. In order for these in-channel and foothill sediment retention basins to effectively trap sediment loads, a substantial proportion of their total capacity must be available each year. Therefore, the TMDLs incorporate an available capacity target which should be met each year for each in-channel sediment and foothill retention basin. If this target is not met on a regular basis, it may prove necessary to reconsider the viability of a sediment control strategy dependent on sediment capture by retention basins and consider the need for measures to further reduce sediment discharge from different sources. The 50% available capacity target is based on RWQCB staff judgement concerning the importance of in-channel and foothill sediment retention basins in the overall sediment management strategy and because the 50% figure mirrors the overall 50% sediment reduction target discussed above. If 50% of the upper basin in-channel sediment retention basin capacity is available, it should be possible to trap enough sediment from upper watershed sources (principally open space) to meet the 50% load reduction target and associated load allocations of concern in the upper watershed.

Section 3.3. Source Analysis

The purpose of the source analysis is to demonstrate that all pollutant sources have been considered, and significant sources estimated, in order to help determine the degree of pollutant reductions needed to meet numeric targets and allocation of pollutant allowances among sources. 40 CFR 130.2 defines a TMDL as the sum of individual wasteload allocations, load allocations and natural background. In order to develop individual allocations, existing and potential sources must be first be characterized. The description of sources is taken largely from the RWQCB staff report (July 1997), and is based on RWQCB reviews of two sediment budgets, sediment monitoring results, and bathymetry surveys which evaluate sediment deposition.

Total Sediment Loading Estimates

The RWQCB Staff Report provides a thorough review of sediment loading estimates (RWQCB, July 1997, pp. 18-29). Total sediment loadings to the Newport Bay and San Diego Creek watersheds have been evaluated through the construction of sediment budgets in 1983 (Boyle Engineering, 1983) and 1995 (Trimble, 1995). A sediment budget provides an accounting of sediment inputs to waterbodies, storage in waterbody channels and basins, and net discharges from waterbodies out of the watershed. These sediment budgets address loadings to both San Diego Creek and Newport Bay. In addition, suspended sediment monitoring data collected through the San Diego Creek Sediment Monitoring Program provide an independent source of information about sediment loading and transport in the watershed. Finally, several bathymetry surveys and scour studies have been analyzed by RWQCB staff to evaluate bedload sedimentation and overall sediment deposition in the watershed. These different sediment analysis methods have yielded reasonably similar estimates of total annual average sediment loading to the Newport Bay watershed as a whole, including channel erosion (approximately 250,000 tons per year). Estimates of net sediment discharge to Newport Bay (primarily from San Diego Creek) ranged between 125,000 and 150,000 tons per year. San Diego Creek contributes approximately 94% of the total sediment loading to Newport Bay. The Trimble sediment budget found that slightly more than half the sediment discharged to San Diego Creek from upland and tributary sources settles out in Creek and trunk channels and sediment basins, and the remainder is discharged into Upper Newport Bay (See Figure 1).

The estimate of sediment contributions from different sources is based on the land use divisions and associated sediment loading rates identified in the Boyle Engineering sediment budget (Boyle Engineering, 1983), as adjusted to reflect land use changes which occurred by 1993. Table 5 summarizes the adjusted estimated sediment loads by land use category. The actual sediment loading estimates were calculated as follows:

1. The area of the Newport Bay and San Diego Creek watersheds in different land use categories were estimated based on 1993 land use information in the RWQCB staff report for the nutrient TMDLs (RWQCB, August 29, 1997). That staff report indicates that in 1993, agricultural uses accounted for 12% and urban uses 64% of the watershed area. For this analysis, it was assumed that construction areas remained at 2% of the watershed area and that open space areas had declined to 22% of the watershed area in order for the land use percentages to sum to 100%. RWQCB staff agreed that this was a reasonable approach to estimating 1993 land uses (personal communication with Ken Theisen, RWQCB, February 26, 1998).

2. The sediment loading rates per square mile for each land use category (from Boyle, 1983) by were multiplied by the number of square miles in that category estimated for 1993.

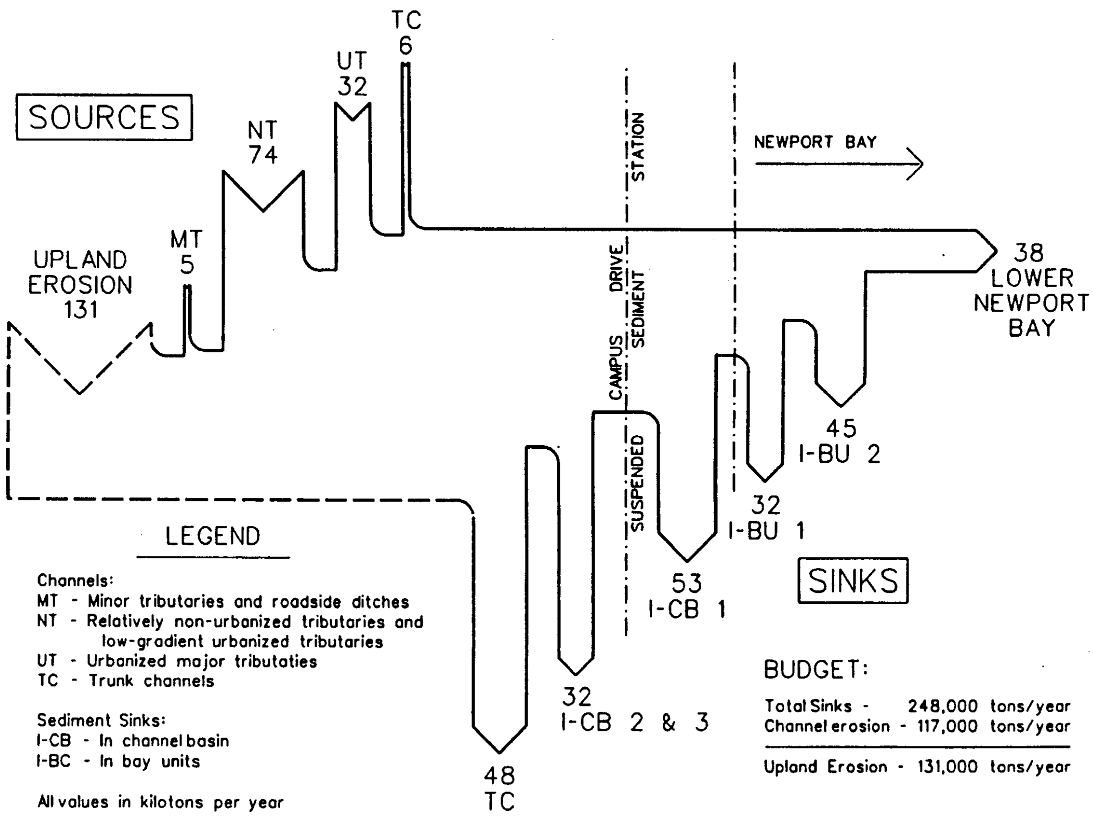

FIGURE 11:
SEDIMENT BUDGET FOR SAN DIEGO CREEK AND UPPER NEWPORT BAY 1986-93.
(Source: OCEMA 1995, Trimble 1995)

Table 5: Estimated Annual Sediment Loads by Land Use Category

Land Use Category	% in Land Use (1993)	Square. Miles in Land Use	Load Rate per Square. Mile (tons per square. mile, Boyle, 1983)	Annual Loads (tons/year)	Adjusted Loads (multiplied by 1.31 to sum to Trimble total) (tons/year)
Open Space	22%	32.7	1300	42,500	55,700
Agriculture	12%	17.9	1600	28,600	37,500

Urban	64%	95.3	50	4,800	6,300
Construction	2%	3.0	6500	19,500	25,500
TOTALS	100%	148.9		95,400	125,000

3. Estimated annual loads for each land use category were adjusted upward such that the total estimated annual loads derived from summing loads from each category equal the 125,000 tons per year estimated in Trimble's 1995 sediment budget. This adjustment was done by multiplying estimated loads from step 2 above by 1.31. The adjustment is reasonable to account for possible inaccuracies in the loading rates estimated by Boyle Engineering in light of the sediment budget results estimated by Trimble. EPA invites comments on the accuracy of this approach, and would appreciate more recent land use data and information on loading rates from different land uses, if reviewers are aware of such information.

The source categories used in Trimble's 1995 sediment budget are less useful for allocation planning purposes because they distinguish between upland and tributary sources only, and not between types of upland sources. The other source analysis methods did not focus on estimation of relative contributions from individual sources. Therefore, the source categories used in the Boyle sediment budget provide the best basis for allocation planning.

Section 3.4. Loading Capacity, the Total Maximum Daily Loads, and Allocations

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the Clean Water Act, as well as in various guidance documents. A TMDL is defined as the sum of the individual waste load allocations for point sources, load allocations for nonpoint sources and natural background pollutants. The TMDL must not exceed the loading capacity of the waterbody (the greatest amount of pollutant loading that a waterbody can receive without violating water quality standards). Allocations may be assigned in a variety of ways (e.g. discharger, sector, land use), but the relationship between the allocations and the loading capacity must be explained. In addition, regulations at 40 CFR 130.2(g) state that "load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading."

The estimates of assimilative capacity and of existing sediment loadings for this watershed are somewhat uncertain; however, they are sufficiently reliable for the purposes of this TMDL.. EPA endorses the RWQCB's plans for follow-up monitoring and evaluation of the TMDLs and their underlying analytical components as a sensible way to proceed in light of these uncertainties.

<u>Loading Capacity and Total Maximum Daily Load</u>

As discussed in the numeric targets section, the RWQCB concluded that a 50% reduction in sediment delivery to San Diego Creek and Newport Bay is needed to protect beneficial uses and meet the narrative water quality objectives. Therefore, the loading capacity is estimated to equal 125,000 tons per year as an annual average for the watershed as a whole to be divided equally between San Diego Creek and Newport Bay (62,500 tons per year for each waterbody). These values were derived by first calculating 50% of the best estimate of total existing sediment loading to the Newport Bay watershed as a whole (50% of 250,000 tons equals 125,000 tons per year) and then distributing half of the calculated loading capacity to San Diego Creek and half to Newport Bay (62,500 tons per year each).

The allocation of half the proposed loading capacity to San Diego Creek and half to Newport Bay is based on the existing estimated sediment distribution within the watershed and the habitat protection goals set for the Creek and Bay. Both of these factors support equal distributions of loading capacity between the Creek and Bay. The Trimble sediment budget found that about half the total sediment discharged to San Diego Creek each year is deposited in sinks within the Creek system (channel and basins), and about half is discharged to Newport Bay. The portion of San Diego Creek sediment loads which reach Newport Bay comprised about 94% of the total sediment loading to the Bay. In order to achieve the target of 50% reduction in sediment loads to both San Diego Creek and Newport Bay, it is appropriate to divide the available loading capacity equally between the Creek and Bay. This approach best tracks the actual distribution of sediment loads and deposition within the entire watershed, and the amount of load reduction needed to protect beneficial uses in both the Creek and the Bay.

The sediment TMDLs for Newport Bay and San Diego Creek are being set at levels equivalent to the estimated Loading Capacities for San Diego Creek and Newport Bay (62,500 tons per year each as an annual average). It is appropriate to establish separate TMDLs and associated allocations for the Creek and the Bay for several reasons. First, sediment discharges and sediment control basins in the Creek and Bay watersheds are managed somewhat independently of each other by different management agencies. Establishing separate TMDLs will help the management agencies have a more specific set of goals to consider in selecting sediment source control and management strategies. Second, separate TMDLs help ensure that the somewhat different beneficial uses of concern in the Creek channels and the Bay are protected since the targeted 50% reduction level is believed to be adequate to protect these uses. Third, a separate TMDL for San Diego Creek provides a mechanism for accounting for the fact that a substantial percentage of the total sediment loads in the San Diego Creek watershed are stored in Creek channels and basins, and subsequently delivered to Newport Bay. Finally, a separate TMDL for Newport Bay provides a mechanism for accounting for sediment inputs from areas around the Bay which are not part of San Diego Creek watershed.

EPA acknowledges that it may be difficult for a sediment source manager to predict the percentage of sediments which would end up in the Creek versus the Bay; however, setting separate TMDLs and allocations provides a clearer basis for implementing San Diego Creek channel maintenance and management decisions affecting net sediment discharge to Newport Bay, and for addressing sediment inputs from the non-San Diego Creek portion of Newport Bay watershed. It should prove feasible to implement and track separate TMDLs because substantial sediment monitoring is planned for the area just above the point where San Diego Creek flows into Upper Newport Bay.

Load and Wasteload Allocations

A portion of total sediment loading is estimated to come from urban areas and construction areas which may be subject to NPDES permitting requirements for municipal stormwater discharges and construction sites. There are no other point sources of sediment in the watershed. The sediment budget analysis which provides the basis for estimating the percentage of loading associated with urban and construction areas does not precisely identify the geographical scope of these source areas. For this reason, it was not possible to ascertain the extent of overlap between the "urban" and "construction" source areas and the areas covered by NPDES stormwater permits in effect for this watershed. This allocation analysis assumes the "urban" and "construction" areas covered by the source analysis are covered by NPDES stormwater permits; therefore, wasteload allocations are being established for these sources.

Nonpoint sources comprise the majority of sediment loadings to the watershed. Load allocations are being established for the Open Space and Agricultural land use source categories. This analysis assumes that because none of the areas covered in these land use categories is subject to NPDES permitting requirements, wasteload allocations are inappropriate.

The load allocations and wasteload allocations were calculated by dividing the total allowed load (i.e., the TMDLs) for each waterbody in proportion to the relative contributions of different land use areas to the total sediment loads. As discussed in the Source Analysis, the relative contributions are estimated based on the Boyle Engineering sediment budget (1983), as adjusted to reflect 1993 land use changes. Table 6 summarizes the TMDL and associated load allocations and wasteload allocations for San Diego Creek. Table 7 summarizes the TMDL and associated load allocations and wasteload allocations for Newport Bay.

Table 6: Total Maximum Daily Loads and Allocations for San Diego Creek
(Tons per year as rolling 10 year annual average)

Land Use	TMDL	Wasteload Allocations	Load Allocations
Total Area	62,500		
Open Space			28,000
Agricultural			19,000
Urban		2,500	

Construction		13,000	

Table 7: Total Maximum Daily Loads and Allocations for Newport Bay
(Tons per year as rolling 10 year annual average)

Land Use	TMDL	Wasteload Allocations	Load Allocations
Total Area	62,500		
Open Space			28,000
Agricultural			19,000
Urban		2,500	
Construction		13,000	

The allocations in this EPA TMDL are slightly different from the RWQCB TMDL allocations adopted in October 1997, but are identical to the revised RWQCB TMDL allocations proposed for adoption in April, 1998 (RWQCB Staff Report, April 1998). The RWQCB is proposed for revision in April, 1998 in order to address potential confusion created concerning numerical values in the October 1997 TMDL and to reflect the more recent land use information discussed above.

These allocations are based on the assumption that the relative sediment contributions from different land use categories as estimated by Boyle in 1983 and adjusted by EPA to reflect 1993 land use changes will remain reasonably accurate for the foreseeable future. While there may be some question as to the accuracy of this assumption, no better analysis is available to provide a basis for allocation planning at this time. Future watershed analysis and monitoring planned by the Sediment Committee and RWQCB, among others, should assist in evaluating the accuracy of the source analysis and appropriateness of the allocations based on the Boyle analysis and EPA adjustments.

These TMDLs do not include separate load allocations for natural background sources as mentioned in 40 CFR 130.2 because virtually the entire watershed and its drainages have been subject to some level of human impact, which has the probable effect of increasing sediment loading rates above naturally occurring erosion rates. Sediment loading rates for some parts of the watershed (especially the Open Space category) may be fairly close to naturally occurring rates for significant portions of the open space area; however, it was not possible based on readily available information to distinguish “natural” loading rates from other loading rates associated with anthropogenic impacts.

Federal regulations provide that wasteload allocations may be made less stringent if best management practices or other nonpoint source pollution controls make more stringent load allocations practicable (40 CFR 130.2(i)). The Newport Bay and San Diego Creek TMDLs and associated allocations are consistent with this requirement because the load allocations are reasonably assured of being attainable. This conclusion is reasonable for allocations to the Open Space category because (1) numerous sediment retention basins have been constructed which have the capacity to capture most if not all of the sediment needed to result in attainment of the 50% reduction target, (2) the RWQCB has adopted sediment reduction requirements for this discharge source as part of the Basin Plan amendment incorporating the sediment TMDLs and associated implementation plans, and (3) agencies responsible for managing sediment discharges from Open Space areas already participate in the ongoing Sediment Committee charged with implementation of the 208 Sediment Control Plan.

This conclusion is reasonable for allocations to Agriculture areas because (1) best management practices have been identified and are in the process of being implemented to help reduce sediment loading associated with ongoing agricultural practices through the 208 Sediment Control Plan, (2) best management practices (especially water use efficiency practices) to be implemented to reduce nutrient loading pursuant to the nutrient TMDLs proposed by EPA and the State should also help reduce sediment loading, (3) land conversion from agricultural to urban land uses are expected to continue for several decades, (4) the RWQCB has adopted sediment reduction requirements for this discharge source as part of the Basin Plan amendment incorporating the sediment TMDLs and associated implementation plans, and (5) agencies responsible for managing sediment discharges from Agricultural Areas already participate in the ongoing Sediment Committee charged with implementation of the 208 Sediment Control Plan. .

Section 3.5. Margin of Safety

Section 303(d) and the regulations at 40 CFR 130.7 require that "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." The margin of safety can either be incorporated implicitly through conservative analytical approaches and assumptions used to develop the TMDL or added explicitly as a separate component of the TMDL (EPA, 1991). The sediment TMDL includes a number of conservative assumptions and approaches which provide the needed margin of safety.

TMDL Calculation Method

The TMDLs were defined as half of the estimated total watershed sediment loads. By selecting the total sediment loading estimate which falls at the low end of the range of estimates as the starting point for this calculation, the resulting TMDLs and associated allocations are smaller than they would have been if a higher total loading estimate had been selected.

Sensitive Habitat Targets

The TMDL approach incorporates sensitive numeric targets focusing upon maintenance of optimal habitat conditions in Upper Newport Bay, the distribution of which is known to be sensitive to excessive sediment loading. The TMDL includes numeric targets for the optimal acreage mix of different habitat types and establishes a target that a 1% change in acreage of any habitat type would trigger a review of the TMDL (RWQCB Basin Plan Amendment, October 17, 1997). The TMDL also includes a numeric target concerning minimum depth of marine habitat in Upper Newport Bay, which, if not met, would trigger a review of the TMDL (RWQCB Basin Plan Amendment, October 17, 1997). The use of numeric indicators which focus directly on the beneficial uses of greatest concern and the incorporation of very sensitive monitoring triggers provides a efficient mechanism for ensuring that the TMDL will be corrected if beneficial uses are not protected through its initial implementation.

TMDLs for Creek and Bay

The TMDL approach incorporates numeric targets, TMDLs, and allocations for both San Diego Creek and Newport Bay in order to focus attention on reduction of sediment impacts in the Creek channels and the Bay. This approach reduces uncertainty associated with a TMDL set for the entire watershed, which would be relatively insensitive to the differences in sediment deposition dynamics and associated impacts in the Creek versus the Bay. In addition, establishing separate TMDLs for the Creek and the Bay should assist the different agencies responsible for source control, channel management, and basin management in identifying the appropriate level and mix of actions to protect both Creek and Bay.

Sediment Basin Management Targets

The TMDL approach recognizes the importance of periodic channel and basin dredging to maintain beneficial uses, and notes the ability to dredge more frequently if the 50% reduction target proves insufficient to maintain habitat quality. Unlike most watersheds, where sediment problems can not be corrected in a cost-effective manner after sediment is discharged, channel and basin dredging to remove harmful levels of sediment is an integral aspect of sediment control strategies used in Newport Bay/San Diego Creek watershed. The TMDL incorporates two types of numeric targets which address the dredging linkage with TMDL attainment.

First, the TMDL includes a target that dredging of Newport Bay sediment basins should be needed no more than about once every 10 years on average at the outset, and no more than about once every 20-30 years in the future in order to maintain the minimum 7 foot target depth for marine habitat areas in Upper Newport Bay Ecological Reserve. If this target is not met, it will trigger evaluation of whether the source reductions are adequate to protect beneficial uses and TMDL revision is warranted.

Second, the TMDL includes a target that at least 50% of the storage capacity of in-channel and foothill sediment retention basins should be available prior to the main sediment runoff season each year to help ensure that these retention basins can actually do their job. This target increases the likelihood that basins will be maintained regularly and that excessive sediment loadings will not reach the downstream areas of greatest beneficial use concern.

Assumptions Concerning Anthropogenic Impacts

These TMDLs contain no separate load allocations for natural background based on the conservative assumption that erosion rates for the entire watershed exceed “natural” levels because virtually the entire watershed has experienced some level of human activity. As a result, the TMDLs assume that excessive sediment loadings from all sources can be addressed through some combination of source controls and/or sediment capture and removal from retention basins and channels.

State Commitment To Monitoring and Evaluation Plan

EPA notes that the RWQCB contains a strong commitment to ensuring that needed follow-up monitoring and TMDL evaluation will occur on a regular basis. The agencies charged with monitoring are required to submit annual monitoring reports. The RWQCB intends to review these results annually and consider the need for TMDL changes if numeric targets are not met. Moreover, the watershed has a long-standing, well-organized sediment control plan included in the RWQCB 208 Plan, which is being implemented by an active Sediment Committee comprised of representatives from virtually all the key agencies in the watershed. The existence of this strong commitment to monitoring, implementation, evaluation, and adaptive management strengthens the conclusion that the TMDL will be modified as soon as it becomes necessary.

Section 3.6. Seasonal Variations

Clean Water Act Section 303(d) requires that TMDLs consider seasonal variations. The Newport Bay and San Diego Creek TMDLs consider seasonal variation issues as follows. Sediment discharges, like most nonpoint source pollutants, occur primarily as a result of precipitation-driven runoff events. Since precipitation in the Newport Bay/San Diego Creek is concentrated during the winter months, most sediment production usually occurs during this season. See RWQCB Staff Report, July 1997 for additional details. However, unlike many pollutants which cause immediate impacts to beneficial uses, sediment impacts may occur long after the discharge at locations far downstream of the discharge sites. In addition, it is extremely difficult to predict the exact location or timing of sediment discharges. The primary sediment impact in this watershed is associated with long term sediment deposition and resulting aggradation of stream channels and the Bay. Therefore, it is appropriate that the TMDLs focus on long term discharge and response timeframes. It is unnecessary and inappropriate to set TMDLs which identify a particular time of year as the critical period of water quality impact. Instead, these TMDLs set long term running annual average maximum sediment loading levels.

The one seasonal issue of concern which is properly addressed in the TMDLs is associated with sediment basin maintenance. A numeric target is established which identifies the need to make available at least half the capacity of upstream sediment retention basins before the onset of the winter storm and runoff season of concern. This measure is appropriate in order to help ensure that adequate sediment trapping capacity is available when needed.

Section 3.7. Critical Conditions

The regulations at 40 CFR 130.7 state that determinations of TMDLs shall take into account critical conditions for stream flow, loading and water quality parameters. These TMDLs take critical conditions concerning flow, loading, and water quality into account as follows. As discussed in the previous section, beneficial use impacts associated with clean sediment usually occur over long time frames due to gradual deposition and resulting channel and basin aggradation. Unlike pollutants which produce short term acute impacts, sediment problems are not normally associated with one most sensitive set of “critical” flow or loading circumstances. Therefore, it is generally unnecessary to identify a critical flow or loading scenario which drives the TMDL values (e.g., a “critical flow”).

The critical condition of most concern in the Newport Bay/San Diego Creek TMDLs would be associated with extremely high sediment loadings caused by unusually high or sustained rainfall and runoff levels. Such events could have the effect of producing sediment loads which would overwhelm the capacity of sediment retention and trapping basins in the watershed, and cause relatively fast deposition of sediments in harmful amounts. This type of event could necessitate a more aggressive response than currently planned in “normal” sediment loading circumstances. For example, dredging of retention basins or stream channels may be needed to maintain habitat characteristics and flood control capacity. In addition, special source control measures may be needed to address problem areas such as eroding stream banks and active landslide areas. These TMDLs provide for rapid responses to this critical condition by incorporating several types of monitoring indicators and associated targets, exceedence of which would trigger review and potential revision of TMDL elements or associated implementation actions.

Section 4. Public Participation

40 CFR 130.7 requires that TMDLs be subject to public review. The State and EPA have provided for public participation through several mechanisms. The Regional Board has held two public workshops as part of their regular meetings to discuss the staff proposals and receive public comments in July 18 and September 12, 1997. The RWQCB formally invited public comments on the proposed TMDL and implementation plan, and held a public hearing to receive additional comments on October 17, 1997. EPA reviewed both the comment letters to the RWQCB and the RWQCB staff's response to comments as part of the development of EPA's proposed and final TMDLs. These comments and the RWQCB's response are incorporated into EPA's administrative record. As a general matter, EPA concurs with the Regional Board's responses to its comments. As to some issues raised, EPA has supplemented the Regional Board's discussion in EPA's responses to comments and in EPA's TMDL document.

EPA noticed the availability of the proposed sediment TMDLs and report on February 27, 1998 and provided the public until March 31, 1998 to submit written comments. A newspaper advertisement announcing the availability of the proposed decision was published in the *Orange County Register*, and notice of availability was mailed to several hundred stakeholder and agency groups identified in a RWQCB mailing list provided to EPA. Comments were received from four organizations concerning the sediment TMDL. EPA considered these comments in reaching its final decision on the TMDLs, and prepared a comment responsiveness summary.

Section 5. Implementation and Monitoring Recommendations

Federal regulations require the State to identify measures needed to implement TMDLs in the state water quality management plan (40 CFR 130.6). EPA has recently established new policies which emphasize the importance of timely implementation of measures to implement TMDLs which address nonpoint source discharges (memo from Robert Perciasepe, Assistant Administrator for Water, to EPA Regional Division Directors, August 8, 1997). EPA expects the State to promptly develop and ensure the implementation of source control measures which are adequate to achieve the goals of the TMDLs.

The RWQCB TMDL report and associated Basin Plan provisions dated October 1997 describe an implementation plan based on:

- activities outlined in the "San Diego Creek Stormwater Sedimentation Control Plan" developed in 1982, which involve multiple agencies and land managers,

- sediment removal actions by the U.S. Army Corps of Engineers, and

- erosion control activities by the cities and county within the watershed, some of which are implemented pursuant to the NPDES stormwater permits.

The Basin Plan language contains specific sediment reduction requirements linked to the TMDLs and their associated allocations. The RWQCB also established a 10 year timeframe for attainment of the TMDL and associated targets. EPA endorses this implementation and attainment timeframe because it implies an aggressive approach to addressing sediment sources, while recognizing likely time lags between the implementation of controls and the recovery of the receiving waters from sediment impacts. It should be noted, however, that NPDES permits affected by the wasteload allocations established in this TMDL must be established consistent with NPDES permitting requirements, including requirements concerning compliance schedules.

EPA commends the RWQCB for its efforts to identify appropriate implementation measures and TMDL attainment timeframes concurrent with the development of the sediment TMDLs, and EPA looks forward to the State's submission of both the final TMDLs and the associated implementation measures.

EPA expects that the State will incorporate the TMDLs and associated implementation measures in the State Water Quality Management Plan (in California, the Basin Plan) upon approval by EPA, as required by 40 CFR 130.6. This requirement may be met through EPA's approval of TMDLs and implementation measures already added to the Basin Plan by the State, or through incorporation of EPA-established TMDLs and State-adopted implementation measures in the Basin Plan following EPA's establishment of the TMDLs.

EPA guidance concerning the development of TMDLs through the phased approach emphasizes the importance of establishing rigorous monitoring and evaluation plans and associated schedules which will guide the review and potential revision of the TMDLs and implementation activities (EPA, 1991). The RWQCB TMDL report and Basin Plan provisions establish a monitoring and evaluation plan which identifies parties responsible for implementation and timeframes for RWQCB review of monitoring results. This monitoring and review plan appears to provide a workable framework consistent with the direction of EPA guidance on phased approach TMDLs.

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